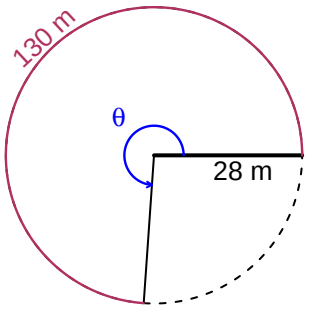
Name: Date:

Trig Final (Solution v34)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 28 meters. The arc length is 130 meters. What is the angle measure in radians?

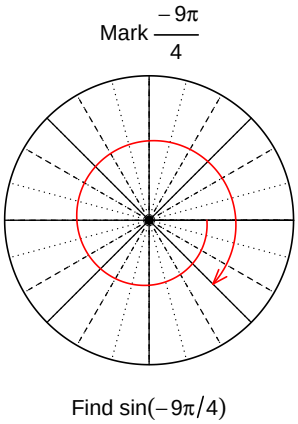


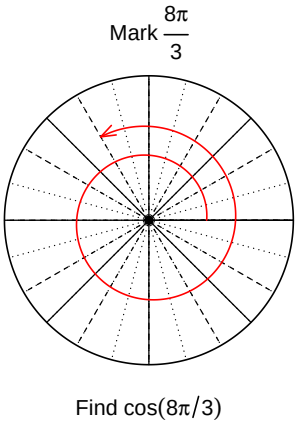
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 4.643$ radians.

Question 2

Consider angles $\frac{-9\pi}{4}$ and $\frac{8\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-9\pi}{4}\right)$ and $\cos\left(\frac{8\pi}{3}\right)$ by using a unit circle (provided separately).





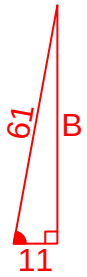
$\sin(-9\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(8\pi/3) = \frac{-1}{2}$

Question 3

If $\cos(\theta) = \frac{-11}{61}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

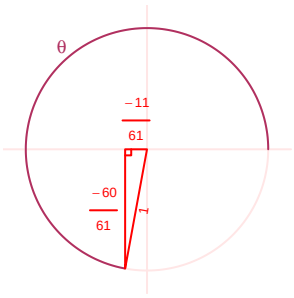
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$11^2 + B^2 = 61^2$$
$$B = \sqrt{61^2 - 11^2}$$
$$B = 60$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-60}{61}}{\frac{-11}{61}} = \frac{60}{11}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -7.51$ meters, a frequency of 6.21 Hz, and an amplitude of 3.78 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 3.78\sin(2\pi 6.21t) - 7.51$$

or

$$y = 3.78\sin(12.42\pi t) - 7.51$$

or

$$y = 3.78\sin(39.02t) - 7.51$$